

**Abstract Title:** Site Selection and Deployment Scenarios for Servicing of Deep-Space Observatories  
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**Response to:** NASA Request for Information (RFI) on Human/Robotic Exploration of the Solar System  
**Abstract:** The deep-space environment and relative transportation accessibility of the Weak Stability Boundary (WSB) region in the Sun-Earth system makes the Sun-Earth Lagrange point an attractive operating region for future observatories. A summary of key characteristics of future observatories designed to operate in this region will be presented. The capability to service observatories that operate within the WSB may greatly enhance their lifetime and scientific return. The range of servicing missions might begin with initial deployment, assembly, test, calibration, and checkout. Post-assembly servicing missions might also include maintenance and repair, critical fluids resupply, and instrument upgrades. We will define the range of servicing missions that can be performed with extravehicular activity, with teleoperated robots, and with state-of-the-art autonomous robots and we will develop deployment scenarios that affect payload design. A trade study will be summarized of the benefits and risks of alternative servicing sites, including at the International Space Station, at other low-Earth-orbit locations, in Lunar orbit, and on-site at the Earth-Sun L2 location. We will summarize required technology trades and development issues for observatory servicing at each site, and with each level of autonomy.

**Synopsis:**

- Background
  - Lessons of telescope servicing
  - New generation of space telescopes
  - Challenges
- Value of Weak Stability Boundary Location
  - Science value of deep space
  - Space transportation value of the WSB region
  - Gateway for human exploration
  - Commercial value of services within WSB
- Servicing Task Classification
  - Activities
  - Level of autonomy
- Design Guidelines for Servicing
  - Conceptual guidelines
  - How to develop a servicing plan
- Benefits and Risks of Alternative Servicing Sites
  - LEO servicing
  - Earth-Moon L1 servicing
  - Sun-Earth L2 servicing
- Deployment Scenarios and Their Pros and Cons
  - Concept of operations
  - Major architecture elements
- Technology Development Requirements
  - Lagrange manifold models
  - LEO to L1 transportation for science facilities and resupply
  - LEO to L1 transportation for human crew
  - Large space structures assembly techniques
  - Large space optics mechanical stability
  - Parts and process standardization
  - Human/robotic cooperative operations techniques